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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

RENNER, CRAIG A

ART UNIT	PAPER NUMBER
2652	//

DATE MAILED: 03/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/741,804

Applicant(s)

HAYAKAWA ET AL.

Examiner

Craig A. Renner

Art Unit

2652

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3,4 and 6-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3,4 and 6-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. The drawings were received on 21 January 2004. These drawings are accepted.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The following is suggested:

--MAGNETIC HEAD WITH NON-MAGNETIC CONDUCTIVE OXIDIZED STOPPER LAYER BETWEEN SOFT MAGNETIC FREE LAYER AND METAL OXIDE LAYER--.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1, 3-4, and 6-14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

- a. In lines 1-5 of claim 1, and lines 2-6 of claim 8, each instance of "a magnetoresistive film comprising an anti-ferromagnetic layer, a ferromagnetic pinned layer, a non-magnetic intermediate layer, a soft magnetic free layer, a non-magnetic and oxidized and conductive film, and an oxide layer of metal selected from Ta, Nb, Ti,

Hf, W or an alloy thereof laminated in this order on a substrate” is indefinite because it is misdescriptive of the disclosure, which teaches/shows a magnetoresistive film comprising an anti-ferromagnetic layer, a ferromagnetic pinned layer, a non-magnetic intermediate layer, a soft magnetic free layer, a non-magnetic and conductive oxidized stopper layer, and an oxide layer of metal selected from Ta, Nb, Ti, Hf, W or an alloy thereof laminated in this order on a substrate (emphasis added). That is, the stopper layer is taught to be made of a non-magnetic and conductive material that stops oxidation, such as, “Cu, Pd, Pt, Os, Rh, Re, Ru, Ag and Au” as detailed in lines 8-10 on page 5, for instance, and is not itself oxidized. Additionally note that the drawings show the stopper layer to be elemental “Cu” at “0.4 nm” thickness.

b. Claims 3-4, 6-7, and 9-14 inherit the indefiniteness associated with their respective base claims and stand rejected as well.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 1, 3-4, and 6-14 are rejected under 35 U.S.C. 102(e) as being anticipated by Pinarbasi (US 6,268,985).

With respect to claims 1, 3-4, 6-7, 9, and 11-12, Pinarbasi (US 6,268,985) teaches a magnetic head (40) having a magnetoresistive film (74/500, for instance) comprising an anti-ferromagnetic layer (218), a ferromagnetic pinned layer (206), a non-magnetic intermediate layer (204), a soft magnetic free layer (208), a non-magnetic and conductive oxidized stopper layer (504, lines 5-6 in column 9, for instance, i.e., "ruthenium" is a non-magnetic and conductive oxidized stopper layer, as admitted by applicant's own disclosure in lines 8-10 on page 5, for instance), and an oxide layer (506) of metal selected from Ta, Nb, Ti, Hf, W or an alloy thereof (line 65 in column 8 thru line 3 in column 9, for instance, i.e., "Ta") laminated in this order (as shown in FIG. 15, for instance) on a substrate (42) [as per claim 1]; wherein the thickness of the metal oxide layer is 1.0 nm or less (lines 7-8 in column 9, for instance) [as per claim 3]; wherein an intermediate layer coupling field showing a magnitude of ferromagnetic coupling between the ferromagnetic pinned layer and the soft magnetic free layer is substantially zero (as shown in FIG. 15, for instance, i.e., an intermediate layer coupling field showing a magnitude of ferromagnetic coupling between the ferromagnetic pinned layer and the soft magnetic free layer would be substantially zero due to the structure depicted in FIG. 15 and accompanying detailed description thereof) [as per claims 4 and 6-7]; wherein the non-magnetic and conductive oxidized stopper layer substantially prevents at least one of diffusion of oxygen from the metal oxide layer, which is an oxide protective layer, and propagation of stresses caused by oxides with respect to the soft

magnetic free layer and degradation of a soft magnetic characteristic of the soft magnetic free layer (lines 5-6 in column 9, for instance, i.e., "ruthenium" prevents at least one of diffusion of oxygen from the metal oxide layer, which is an oxide protective layer, and propagation of stresses caused by oxides with respect to the soft magnetic free layer and degradation of a soft magnetic characteristic of the soft magnetic free layer) [as per claim 9]; wherein the non-magnetic and conductive oxidized stopper layer has a thickness so that an intermediate layer coupling field showing a magnitude of ferromagnetic coupling between the ferromagnetic pinned layer and the soft magnetic free layer is substantially zero (lines 5-6 in column 9, for instance, i.e., "ruthenium... between 3 Å to 30 Å" will cause an intermediate layer coupling field showing a magnitude of ferromagnetic coupling between the ferromagnetic pinned layer and the soft magnetic free layer to be substantially zero) [as per claim 11]; and wherein the thickness of the non-magnetic and conductive oxidized stopper layer enables a change of resistance to be maximized (lines 5-6 in column 9, for instance, i.e., "ruthenium... between 3 Å to 30 Å" will enable a change of resistance to be maximized) [as per claim 12].

With respect to claims 8, 10, and 13-14, Pinarbasi (US 6,268,985) teaches a magnetic recording apparatus (30) including a magnetic recording medium (34) for recording information, a magnetic head (40) having a magnetoresistive film (72/500, for instance) comprising an anti-ferromagnetic layer (218), a ferromagnetic pinned layer (206), a non-magnetic intermediate layer (204), a soft magnetic free layer (208), a non-magnetic and conductive oxidized stopper layer (504, lines 5-6 in column 9, for

instance, i.e., "ruthenium" is a non-magnetic and conductive oxidized stopper layer, as admitted by applicant's own disclosure in lines 8-10 on page 5, for instance), and an oxide layer (506) of metal selected from Ta, Nb, Ti, Hf, W or an alloy thereof (line 65 in column 8 thru line 3 in column 9, for instance, i.e., "Ta") laminated in this order (as shown in FIG. 15, for instance) on a substrate (part of 42), a head slider (rest of 42) for holding the magnetic head, an actuator (includes 46) for guiding the head slider to a predetermined recording position on the recording medium, a spindle motor (36) rotating the recording medium and a signal processing system (50) for processing information read out of the magnetic recording medium [as per claim 8]; wherein the non-magnetic and conductive oxidized stopper layer substantially prevents at least one of diffusion of oxygen from the metal oxide layer, which is an oxide protective layer, and propagation of stresses caused by oxides with respect to the soft magnetic free layer and degradation of a soft magnetic characteristic of the soft magnetic free layer (lines 5-6 in column 9, for instance, i.e., "ruthenium" prevents at least one of diffusion of oxygen from the metal oxide layer, which is an oxide protective layer, and propagation of stresses caused by oxides with respect to the soft magnetic free layer and degradation of a soft magnetic characteristic of the soft magnetic free layer) [as per claim 10]; wherein the non-magnetic and conductive oxidized stopper layer has a thickness so that an intermediate layer coupling field showing a magnitude of ferromagnetic coupling between the ferromagnetic pinned layer and the soft magnetic free layer is substantially zero (lines 5-6 in column 9, for instance, i.e., "ruthenium... between 3 Å to 30 Å" will cause an intermediate layer coupling field showing a magnitude of ferromagnetic

coupling between the ferromagnetic pinned layer and the soft magnetic free layer to be substantially zero) [as per claim 13]; and wherein the thickness of the non-magnetic and conductive oxidized stopper layer enables a change of resistance to be maximized (lines 5-6 in column 9, for instance, i.e., "ruthenium... between 3 Å to 30 Å" will enable a change of resistance to be maximized) [as per claim 14].

Response to Arguments

6. Applicant's arguments filed 21 January 2004 have been fully considered but they are not persuasive.

The applicant argues that Pinarbasi does not teach "a non-magnetic and conductive oxidized film or stopper layer as disclosed and claimed herein." This argument, however, is not found to be persuasive for the following: In so far as this limitation is definite and understood as detailed in paragraph 4a, supra, Pinarbasi teaches a non-magnetic and conductive oxidized stopper layer (504, lines 5-6 in column 9, for instance, i.e., "ruthenium" is a non-magnetic and conductive oxidized stopper layer, as admitted by applicant's own disclosure in lines 8-10 on page 5, for instance). Considering arguendo, however, that the argued limitation is in some way definite, Pinarbasi will still read on this argued limitation as follows, for instance: a non-magnetic and oxidized conductive film (506), and an oxide layer (508) of metal selected from Ta, Nb, Ti, Hf, W or an alloy thereof (lines 11-15 in column 9, for instance, i.e., "Ta₂O₅").

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Craig A. Renner whose telephone number is (703) 308-0559. The examiner can normally be reached on Tuesday-Friday 7:30 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa T. Nguyen can be reached on (703) 305-9687. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Craig A. Renner
Primary Examiner
Art Unit 2652

CAR